

List of Indiana Department of Transportation (INDOT) FY 2021 Research Needs (as of October 5, 2020)

Instructions: This listing is for use by Faculty from accredited Indiana Universities. For additional information or to express an interest in a Research Need listed, please contact the JTRP Program Director at snoureldin@indot.in.gov. If expressing an interest in a Research need, attach your CV/resume to your email response.

#	Status	SPR	Focus Group	Submitter	RNS Title
1	Awarded	4122	SHE	Rearick	Expansion - Repair and Strengthening of Bridges in Indiana Using Fiber Reinforced Polymer (FRP) Systems
2	Approval Pending	4153	SHE	Boruff	Expansion and Extension - INDOT Highway Lighting Support Services
3	Awarded	4253	PMGC	Nantung	Waylink Contract - Forensic Investigations
4	Proposal Pending	4320	SHE	Wells	Expansion and Extension Implementation of Epoxy Injection of Concrete Overlaid Bridge Decks
5	Awarded	4327	PMGC	Becker	Expansion Development of Compaction Control Guidelines for Aggregate Drainage Layers and Evaluation of In Situ Permeability Testing Methods for Aggregates
6	Approval Pending	4351	SHE	Beeson	Expansion and Extension - Minimizing Blast Furnace Slag (BFS) Leachate Through Improved Product Acceptance Criterion and Siting Considerations
7	Awarded	4445	SHE	Rearick	Expansion - Long Term Project and Network Level NDT Implementation Plan for Indiana
8	Awarded	4447	PMGC	Nantung	Expansion & Extension - MEPDG Implementation (Validation/Model Calibration/Acceptable Distress Target/IRI Failure Trigger/Thermal Selection/Binder Selection)
9	Proposal Pending	4502	DDC	Fowler	Heavy Fleet and Facility Optimization
10	Approval Pending	4504	MOP	Brooks	Development of Slab Jacking Program
11	Proposal Pending	4508	PMFAME	Steckler & Fisher	Forecasting Freight Logistics needs & INDOT Plans for the Needs
12	Awarded	4509	PMFAME	Steckler, Fisher, Chandler	A Strategic Assessment of Needs and Opportunities for Wider Adoption of Renewable Energy and Electrification in Indiana
13	Proposal Pending	4511	PMFAME	Steckler & Fisher	Mobility & Safety Considerations of Truck Platooning at Interstate Highways
14	Awarded	4512	PMGC	Salgado & Prezzi	Pile Stability Analysis in Soft Soils - Guidance on Foundation Design Assumptions with Respect to Loose/Soft Soil Effects on Pile Lateral Capacity and Stability

15	Awarded	4513	PMGC	Lu	Determining Optimal Traffic Opening Time through Concrete Strength Monitoring – Wireless Sensing
16	Awarded	4514	PMGC	Cho & Haddock	Material Characterization and Determination of MEPDG Input Parameters for Indiana Superpave 5 Asphalt Mixtures
17	Awarded	4516	PMGC	Salgado & Prezzi	Development of Protocols for Reuse Assessment of Existing Foundations in Bridge Rehabilitation and Replacement Projects
18	Proposal Pending	4517	PMGC	Shin	Field Drainage Evaluation Test on I-69 Added Travel Lanes
19	Awarded	4518	PMGC	Lee	Review of Indiana Asphalt Binders (In-Situ PG Grade asphalt determination)
20	Awarded	4520	PMGC	Becker	Development of an MSE Wall Construction Manual and Training Course
21	Awarded	4521	PMGC	Cho & Krogmeier	Comprehensive Pavement Patching Tools and Web based Software for Pavement Condition Assessment and Visualization
22	Awarded	4522	S	Lane	Design of Educational Material & Public Awareness Campaigns for Improving Work Zone Driver Safety
23	Awarded	4523	S	Lane	Applied Ergonomics
24	Awarded	4524	S	Lane	Evaluation of the impact of On Vehicle Digital Communication Alerts to Improve INDOT and Motorist Safety
25	Awarded	4526	SHE	Dyke & Rearick	Predictive Analytics for Quantifying the Long-Term Cost of Defects during Bridge Construction
26	Awarded	4527	SHE	Varma	Shear and Bearing Capacity of Corroded Steel Beam Bridges and Effects on Load Rating
27	Approval Pending	4529	SHE	Connor	Pedestrian Bridges -- Development of New Criteria for Design & Construction
28	Proposal Pending	4532	SHE	Varma	Long-term durability of fire damaged and repaired bridges in Indiana
29	Awarded	4536	TESMO	Cox & Bullock	Implementation of Enhanced Probe Data (CANBUS) for Tactical Workzone and Winter Operations Management
30	Awarded	4537	TESMO	McCoy	Speed Management on Freeways in Transition Zones between Rural and Urban Conditions
31	Awarded	4540	TESMO	Tarko	Incorporating Time Dependent Data to Pro-Active Safety Management –A Pilot Study
32	Awarded	4541	TESMO	Steckler	Roadside Barrier End Treatments: Safety Evaluation of INDOT Inventory and Practices
33	Awarded	4542	TESMO	Plattner	Alternative Strategies for Roadway Work Zone Safety and Productivity
34	Awarded	4545	TESMO	McCoy	Alternate Interchange Signing Study for Indiana Highways
35	Awarded	4546	PMGC	Zaheer & Khan	Implementation Study: Continuous, Wireless Data Collection and Monitoring of the Sagamore Parkway Bridge

36	Under Consideration	Tier 2	PMFAME	Steckler, Fisher, Chandler	SPR 4510 Roadway Assets to Support Connected and Automated Vehicles (\$150K)
37	Under Consideration	Tier 2	PMGC	Cai	SPR 4519 Expanding the construction checklist to including 600, 800, and 900 sections (\$146.8K)
38	Under Consideration	Tier 2	S	Lane	SPR 4525 Color Patterns (\$47.640K)
39	Under Consideration	Tier 2	SHE	Ramirez	SPR 4533 Improved Link Slab Connections for Jointless Bridge Decks (\$278K)
40	Under Consideration	Tier 2	SHE	Fitzgerald	SPR 4535 Pedestrian Bridges -- Development of Formalized Program for Inspection -- Frequency, Depth of Inspection, etc.(\$124.243K)
41	Under Consideration	Tier 3	DDC #2	Fowler	Failed Materials Review/Timing of Construction Projects/Market Influence (was 4501)
42	Under Consideration	Tier 3	PMGC #4	Zhang	Integration of BIM for higher efficiency and stronger quality control in contractor/consultant submittal review (was 4515)
43	Under Consideration	Tier 3	PMGC #11	Chen	Work Zone Optimization to Improve Drivers' Cognitive Workload and Driving Performance
44	Under Consideration	Tier 3	PMGC #12	McDaniel	Expanded Implementation of a Friction Performance Test for Compacted Asphalt Mixtures
45	Under Consideration	Tier 3	PMGC #13	Lu	In-situ Sensing of Spatial and Size Distribution of Air-voids in Concrete Pavement
46	Under Consideration	Tier 3	PMGC #14	Fox	Modified 401 QC/QA density requirements for rural, low traffic roadways with full depth asphalt pavements exhibiting stripping and/or subgrade issues in existing bound layers with high FWD deflections
47	Under Consideration	Tier 3	PMGC #15	Hubbard	Utilizing Construction Contractor UAS Data to Support INDOT Activities
48	Under Consideration	Tier 3	SHE-09	Bowman	Development of Truck for Bridge Load Rating -- Changeable Axle Spacing and Axle Load (was 4534)
49	Under Consideration	Tier 3	SHE	Dyke	Decision Support for Incident Command
50	Under Consideration	Tier 3	SHE	Bryan	Demonstration Project for UAS to Support Bridge Inspection Safety
51	Under Consideration	Tier 3	SHE	Varma	Standardized & Efficient Bridge Designs and Details for Typical Spans in Indiana
52	Under Consideration	Tier 3	SHE	Varma	Education, Training, and Workshops on Design of Steel Beam Bridges in Accordance with the Latest AASHTO and INDOT Bridge Design Manual
53	Under Consideration	Tier 3	SHE	Prakash	Feasibility Study for Use of Digital Twinning Technology for Life-Cycle Analysis, Design and Management of Indiana Bridges
54	Under Consideration	Tier 3	SHE	Ramirez	Accelerated Bridge Construction (ABC) for Indiana-Synthesis Study: Structural Issues and Opportunities
55	Under Consideration	Tier 3	SHE	Jung	Generation of textured, 3D bridge models by photogrammetry, to facilitate virtual inspection

56	Under Consideration	Tier 3	SHE	Jahanshahi	Augmented Reality for Bridge Inspection
57	Under Consideration	Tier 3	SHE	Lyn	Hydraulic Modeling Using New Army Corps of Engineers 2-Dimensional Hydraulic Analysis Software
58	Under Consideration	Tier 3	SHE	Anwar	Time Domain Sensor Fusion to Improve Image Quality
59	Under Consideration	Tier 3	SHE	Bailey	Knowing Limitation of HY-8 Software
60	Under Consideration	Tier 3	SHE	Connor	NDT Performance Testing (Accreditation) for Technicians & Equipment
61	Under Consideration	Tier 3	SHE	Bowman	Deterioration of H-Pile Bridge Foundations -- Does Indiana have a problem?
62	Under Consideration	Tier 3	SHE	Bowman	Slip Critical Strength of Connection. Are we getting the exact specified Class resistance in the field?
63	Under Consideration	Tier 3	SHE	Varma	Question of How Steel Bridge Shear Strength Has Been Developed by AASHTO
64	Under Consideration	Tier 3	SHE	Ortiz	Element Level Bridge Inspection Data -- Exploration of additional uses of data, from decision making to asset management.
65	Under Consideration	Tier 3	SHE	Dyke	Bridge Inventory Database -- Data Population from Existing Sources
66	Under Consideration	Tier 3	SHE	Rearick	Methodology Development for Incorporation of NDT Data Into Asset Management Process
67	Under Consideration	Tier 3	SHE	Rearick	Accreditation of NDT Equipment and Operators
68	Under Consideration	Tier 3	SHE	Williams	Implementation of "Deck Beams", Where the Top Flange is the Deck
69	Under Consideration	Tier 3	SHE	Williams	Stur & Tie Code Reinforcement Requirement for Crack Control
70	Under Consideration	Tier 3	SHE	Williams	Use of FRP Strands for Prestress Applications
71	Under Consideration	Tier 3	SHE	Hart	Data Extraction from Old Plans
72	Under Consideration	Tier 3	SHE	Wagner	Digital Plans/Model Construction
73	Under Consideration	Tier 3	TESMO	Sturdevant	Variable Speed Limits -- Strategic & Tactical Use Case Development (Inputs, Spacing, weather conditions, Triggers)- was 4539
74	Under Consideration	Tier 3	TESMO	Saha	Developing Mitigation Strategy to Reduce Emergency Medical Service (EMS) Response Time to Crash Sites in an Urban Area
75	Under Consideration	Tier 3	TESMO	Woldemariam & Abraham	Evaluation of Intersection Improvement Projects in Indiana
76	Under Consideration	Tier 3	TESMO	Treon (ISP) and Bullock	Development of Forensics Data Protocol for Connected/Autonomous Vehicles Involved in Motor Vehicle Crashes

77	Under Consideration	Tier 3	TESMO	Cai	Freight Truck Flow Modeling Supported by INDOT Highway Surveillance Cameras
78	Under Consideration	Tier 3	TESMO	Hubbard	Installation and Evaluation of an Offset Pedestrian Crossing with a Pedestrian Hybrid Beacon
79	Under Consideration	Tier 3	TESMO	Chen	Work Zone Optimization to Improve Drivers' Cognitive Workload and Driving Performance
80	Under Consideration	Tier 3	TESMO	Hastak	Improving the Traffic Sign Management Leveraging low-cost monitoring system
81	Under Consideration	Tier 3	TESMO	Holowaty	Truck vs. Car Interactions on Indiana Highways
82	Under Consideration	Tier 3	TESMO	Sagstetter	Flashing Yellow Arrow -- Safety Analysis
83	Under Consideration	Tier 3	TESMO	Krogmeier	Slow Moving Vehicle Smartphone App for Warning Motorists
84	Under Consideration	Tier 3	TESMO	Lee	Truck Parking Management -- Safety Overall
85	Under Consideration	Tier 3	TESMO	Jung	Traffic Sign Geo-Location Extraction From Video
86	Under Consideration	Tier 3	TESMO	Oh	Traffic Sign Management Leveraging Public Vehicles
87	Under Consideration	Tier 3	TESMO	Kang	Inspecting Lane Change Barrel Placement Using Image Processing
88	Under Consideration	Tier 3	TESMO	Mathew	Improving Interstate Crash Scene Documentation Using UAV Based Video
89	Under Consideration	Tier 3	TESMO	Mou	Resilience in Large Scale Network of Autonomous Vehicles
90	Under Consideration	Tier 3	TESMO	Boruff	Viable Detour Development for Non-Interstate Projects
91	Under Consideration	Tier 3	TESMO	Holowaty	Roads w/Random & Recurring Congestion -- Predicting Time & Location
92	Under Consideration	Tier 3	TESMO	Plattner	Safety Analysis of "Rolling Slow-Down" for Work-Zones -- Is This Safer Than Full Closure?
93	Under Consideration	Tier 3	TESMO	Boruff	Forensic Investigation of Adaptive Cruise Control (ACC) System Enabled Crashes On Interstates
94	Under Consideration	Tier 3	TESMO	Romero	Extracting Roadway Features From Video Log and High-Resolution GIS Data.
95	Under Consideration	Tier 3	TESMO	Mou	Learn Human Driving Styles To Predict Roadway Safety -- Control & Optimization
96	Under Consideration	Tier 3	TESMO	Holowaty	Railroad Crossing Safety -- Synthesis of New Strategies for Improving Safety
97	Under Consideration	Tier 3	TESMO	Lee	Life-Cycle Analysis Tool for Evaluating Alternative Intersection Types
98	Under Consideration	Tier 3	TESMO	Oh	Traffic Sign Recognition with Dashboard Camera to Generate Maintenance Information

99	Not approved for funding	Tier 4	DDC #1	Fowler	TMC/WAZE Message Boards & Speed Compliance Driver-pedestrian Awareness (was 4500)
100	Not approved for funding	Tier 4	DDC #4	Fowler	Implementation Project for Snowplow Calibration (was 4503)
101	Not approved for funding	Tier 4	MOP-02	Ambrose	Preventing Salt Lumping Using Cost Effective Additives. (Was 4505)
102	Not approved for funding	Tier 4	MOP-03		Develop tool for proper backfill procedures (was 4506)
103	Not approved for funding	Tier 4	MOP-04		Build in-house automated weather forecasting application (was 4507)
104	Not approved for funding	Tier 4	MOP		Timely reporting of pavement conditions for maintenance work planning
105	Not approved for funding	Tier 4	MOP	Wubeshet & Abraham	Optimization of Snowplow Operation
106	Not approved for funding	Tier 4	MOP	Habib and Bullock	Unmanned Airborne Systems for Stockpile Volume Estimation and Landslide Monitoring
107	Not approved for funding	Tier 4	MOP	Bullock	Integrating Enhanced Probe Data into Winter Operations Fleet Management
108	Not approved for funding	Tier 4	MOP	Hastak	Synthesis Study on Best Practices for Mapping and Coordinating Detours for Maintenance of Traffic including Risk Assessment/Management for Duration of Traffic Control Activities: SPR4405 (Phase 2)
109	Not approved for funding	Tier 4	MOP	Hastak	Guidelines for effective the use of the Snow plowable reflective pavement markers (SRPMs) for improved safety and winter operation
110	Not approved for funding	Tier 4	MOP	Kang	Synthesis Study of Selection and Utilization of Resources for Winter Operation
111	Not approved for funding	Tier 4	MOP		Central parts depot - cost comparison of stocking items centrally vs district
112	Not approved for funding	Tier 4	MOP		Equipment and operator prioritization/scheduling tool
113	Not approved for funding	Tier 4	MOP		Appropriate/long lasting alternatives for HMA during winter months
114	Not approved for funding	Tier 4	MOP		MOT for minimal time to repair activities
115	Not approved for funding	Tier 4	MOP		Ditching efficiencies
116	Not approved for funding	Tier 4	MOP		Review of fleet best practices
117	Not approved for funding	Tier 4	MOP		Facilities - Identify costs required to fix/bring our locations into compliance
118	Not approved for funding	Tier 4	MOP		Chip seal next steps? Cost benefit of fog seal/oil and stone material comparison
119	Not approved for funding	Tier 4	MOP		Alternate work schedule cost/productivity comparison
120	Not approved for funding	Tier 4	MOP		Proper underdrain inspection and cleaning
121	Not approved for funding	Tier 4	MOP		LIDAR for sight distance issues
122	Not approved for funding	Tier 4	MOP		Inventory control system

123	Not approved for funding	Tier 4	MOP		What is the appropriate amount of material needed in stockpiles?
124	Not approved for funding	Tier 4	MOP		Automated oil distributor for chip seal/paving
125	Not approved for funding	Tier 4	MOP		Heavy equipment training (reduce equipment damage and injuries)
126	Not approved for funding	Tier 4	MOP		Dealing with more work than planned/Deferred Maintenance
127	Not approved for funding	Tier 4	MOP		What is the appropriate amount of equipment needed?
128	Not approved for funding	Tier 4	MOP		Using AI to determine road conditions/identify traffic concerns
129	Not approved for funding	Tier 4	PMFAME 5	Steckler, Gkritza, Labi	Forecasting & Scenario Transportation Planning of Land Use Changes & Travel Behavior into the Future (10 years, 20 years, 40 years). (was 4510)
130	Not approved for funding	Tier 4	PMFAME/ TESMO	Gao	Assessing the financial impact of passenger traffic leakage from IND airport on Indiana economy
131	Not approved for funding	Tier 4	PMFAME	Steckler & Fisher	INDOT-Private Sector Relationship for Electric Vehicle Charging Service (& other alternative fuels),
132	Not approved for funding	Tier 4	PMFAME	Chandler & Labi	Roadway Assets needed to support CAVs
133	Not approved for funding	Tier 4	PMFAME	Noureldin	Uncertainty and Risk Assessment Techniques in Asset Management; Budgeting; Capital Program Funding; Cost Estimates & Decision Making
134	Not approved for funding	Tier 4	PMFAME	Noureldin	Institutionalizing Percent of Road User Costs in Decision Making
135	Not approved for funding	Tier 4	PMFAME	Labi	Efficacy of integrated bundling and scheduling of INDOT projects
136	Not approved for funding	Tier 4	PMFAME	Steckler	Comprehensive Review of Distribution of Road Jurisdiction/Ownership in Indiana.
137	Not approved for funding	Tier 4	PMFAME	Fisher & Kaiser	Impact of road closures on Agriculture industry during harvesting seasons
138	Not approved for funding	Tier 4	PMFAME	Hastak	Optimized Detour
139	Not approved for funding	Tier 4	PMFAME	Noureldin	Research to support Data Governance Initiative – Information Quality Committee
140	Not approved for funding	Tier 4	PMFAME	Fisher/Labi	Opportunities for Operations Synergies between INDOT and Aviation Partners
141	Not approved for funding	Tier 4	PMFAME	Brassard	Opportunities to Improve Damage to State Property Collections
142	Not approved for funding	Tier 4	PMFAME	Noureldin	Probe study into Vehicle Technology Impacts on Revenues (CAV, EV & FEV)
143	Not approved for funding	Tier 4	PMFAME	Labi	Staging of revenue policy changes due to disruptive technologies
144	Not approved for funding	Tier 4	PMFAME	Cai	Digital Twin for Infrastructure Asset Management
145	Not approved for funding	Tier 4	PMFAME	Fisher	Developing measures of annual mobility impacts (all modes)
146	Not approved for funding	Tier 4	PMFAME	Saha	Evaluation of the Effectiveness of INDOT Research Program

147	Not approved for funding	Tier 4	PMGC-C-3	Chen	Training Optimization of New Technologies based on Workers' Information Preference and Cognitive Workload
148	Not approved for funding	Tier 4	PMGC-C-4	Cai	Mitigating the impact of utility conflicts during highway construction
149	Not approved for funding	Tier 4	PMGC-C-5	Cai	Structured approach to enforcing ADA regulations in road design and construction
150	Not approved for funding	Tier 4	PMGC-C-6	Cai	Road Performance Monitoring via Ubiquitous Human Sensing
151	Not approved for funding	Tier 4	PMGC-C-7	Cai	Training and certifying construction inspectors
152	Not approved for funding	Tier 4	PMGC-C-9	Cai	Analyzing Interactions among Crash Causes, Road Conditions, and Countermeasures for Work Zone Safety Improvement
153	Not approved for funding	Tier 4	PMGC-C-10	Cai	Bridge inspection from underneath using UAS and GPR
154	Not approved for funding	Tier 4	PMGC-C-11	Cai	Digital Twin for Infrastructure Asset Management
155	Not approved for funding	Tier 4	PMGC-C-12	Hubbard	Evaluation of Construction Manager as Constructor (CMC) Project Delivery for use at INDOT
156	Not approved for funding	Tier 4	PMGC-C-14	Kang	Evaluation of the Liquidated Damages clause considering Maintenance of Traffic (MOT) and the Road User Costs for INDOT
157	Not approved for funding	Tier 4	PMGC-C-15	Hastak	Feasibility Study for Refining Warranty Provisions on INDOT Construction Projects
158	Not approved for funding	Tier 4	PMGC-G-1	Khan	Assessment of Geocomposites for Concrete Pavements Drainage
159	Not approved for funding	Tier 4	PMGC-G-2	Khan	Pile foundation is used to harness energy.
160	Not approved for funding	Tier 4	PMGC-G-3	Khan	Monitor the screw piles construction, perform instrumentation and develop the Unique Special provision (implementation Research)
161	Not approved for funding	Tier 4	PMGC-G-5	Salgado/Pr ezzi	Development of Pile Driving Analysis for Open-Ended Pipe Piles
162	Not approved for funding	Tier 4	PMGC-G-7	Salgado/Pr ezzi	Load-Carrying Capacity of Cap-Pile Group-Soil System
163	Not approved for funding	Tier 4	PMGC-G-8	Salgado/Pr ezzi	Development of Database for Geotechnical Properties in Indiana
164	Not approved for funding	Tier 4	PMGC-G-9	Salgado/Pr ezzi	Development of Design Methods for Piles in Gravelly Soils
165	Not approved for funding	Tier 4	PMGC-G-11	Becker	Improved Methods for Constructing Cement Stabilized Subgrade
166	Not approved for funding	Tier 4	PMGC-G-12	Salgado/Pr ezzi	Quality control methods and criteria for compaction of coarse aggregates
167	Not approved for funding	Tier 4	PMGC-M-1	Pauley	Data Collection and Cataloguing of Various HMA Performance Tests
168	Not approved for funding	Tier 4	PMGC-M-2	Olek	Concrete Patching – improved methods for prediction of temperature build-up and strength gain
169	Not approved for funding	Tier 4	PMGC-M-3	Cho	"Implementation of Performance-Related Specifications on Asphalt Paving Projects in Indiana "

170	Not approved for funding	Tier 4	PMGC-M-4	Cho/Haddock	Quality Control Methodology in Asphalt-Treated Cold Recycled Pavement Construction: CIR, CCPR, and FDR
171	Not approved for funding	Tier 4	PMGC-M-7	Lu	Developing in-situ moisture sensing technology for concrete curing assessment
172	Not approved for funding	Tier 4	PMGC-M-8	Youngblood	Composite Liner Freeze-Thaw Responses for Indiana Stormwater Culverts
173	Not approved for funding	Tier 4	PMGC-M-9	Zander	Accuracy of Concrete Works Software to Predict PCC Mixture/Materials Temperature and Strength Development for Full Depth PCCP Patching
174	Not approved for funding	Tier 4	PMGC-M-10	Jung	Photogrammetry-Based 3D Scanning System for Asphalt Cores
175	Not approved for funding	Tier 4	PMGC-M-11	McDaniel	Use of Fiber Additives in Asphalt Pavements
176	Not approved for funding	Tier 4	PMGC-M-12	McDaniel	Effects of Warm Mix Asphalt Foaming Technology
177	Not approved for funding	Tier 4	PMGC-M-14	McDaniel	Establishment and Operation of an Indiana Material Reference Library
178	Not approved for funding	Tier 4	PMGC-M-15	McDaniel	Maintaining and Updating Training Materials
179	Not approved for funding	Tier 4	PMGC-M-16	Behnood	Applications of rejuvenators to allow for increased contents of recycled materials in asphalt pavements
180	Not approved for funding	Tier 4	PMGC-M-17	Behnood	Performance balanced mix design for asphalt mixtures containing warm mix asphalt (WMA) additives
181	Not approved for funding	Tier 4	PMGC-M-18	Lizancos/Martinez	Multiscale characterization of concrete aggregates towards minimal concrete pavement polishing
182	Not approved for funding	Tier 4	PMGC-M-19	Lizancos/Martinez	Simple, portable, and power free test for quantitative determination of water to cement ratio using magnetic levitation
183	Not approved for funding	Tier 4	PMGC-M-20	Lizancos/Martinez	Smart Pebbles: Automatic durability monitoring of concrete pavement using low-cost wireless device capable to accurately measure internal electricity
184	Not approved for funding	Tier 4	PMGC-M-22	Beeson	Utilizing Spectral Analysis to Identify and Fingerprint Aggregates
185	Not approved for funding	Tier 4	PMGC-M-23	Beeson	Utilizing Imaging Technology for Validation of Tack Coat Coverage
186	Not approved for funding	Tier 4	PMGC-M-24	Olek	Effects of penetrating sealers applied to saw-cut surfaces of the joints on their durability
187	Not approved for funding	Tier 4	PMGC-M-25	Olek	Effects of anti-icers on concrete durability relative to mixture composition and moisture conditions
188	Not approved for funding	Tier 4	PMGC-M-26	Lizancos	Effect of recycled concrete aggregates from Indiana on scaling and freeze and thaw
189	Not approved for funding	Tier 4	PMGC-M-27	Lizancos	Variability of using recycled aggregates in Indiana infrastructures: Economic, technical, and environmental viability assessment

190	Not approved for funding	Tier 4	PMGC-M-28	Lizancos/Zavateri	Redefinition of aggregate gradation specifications to improve consistency, durability, and strength of prescriptive concrete pavements
191	Not approved for funding	Tier 4	PMGC-M-29	Lee	Exploring Asphalt Binder Performance Grades for Indiana Mixtures
192	Not approved for funding	Tier 4	PMGC-M-30	Jung	Automated Pavement Core Sample Analysis
193	Not approved for funding	Tier 4	PMGC-P-3	Lowther	Underdrain System Enhancements including Cleanouts
194	Not approved for funding	Tier 4	PMGC-P-4	Harris/Krogmeier	Micropower Ground Penetrating Polarimetric Radar for Roadway Patch Detection, Inspection and Identification
195	Not approved for funding	Tier 4	PMGC-P-5	Kaiser	Concrete Patching Removal Method
196	Not approved for funding	Tier 4	PMGC-P-6	Moser	Full Depth HMA Patching
197	Not approved for funding	Tier 4	PMGC-P-7	Kaiser	Effects of horse-drawn carriages on pavement
198	Not approved for funding	Tier 4	PMGC-P-8	Olek	Friction Policy for Concrete Pavement
199	Not approved for funding	Tier 4	PMGC-P-10	Becker	Assessment of Geocomposites for Concrete Pavements Drainage
200	Not approved for funding	Tier 4	PMGC-P-11	Jan Olek	Concrete Patching – improved methods for prediction of temperature build-up and strength gain
201	Not approved for funding	Tier 4	PMGC-P-12	Lizancos/Gomez	Improving durability of pothole repairs in concrete pavement using computational modeling and experimental testing
202	Not approved for funding	Tier 4	PMGC	Shan	Development of an Operational Technology and Procedure for Smartphone Image-Based Road Roughness Measurement
203	Not approved for funding	Tier 4	S	Chen	Training Optimization of New Technologies based on Workers' Information Preference and Cognitive Workload
204	Not approved for funding	Tier 4	SHE-05	Williams	UHPC Implementation and Usage in Indiana -- Developing Cost Effective Use Cases (was 4530)
205	Not approved for funding	Tier 4	SHE-06	Baah	Addition of Polypropylene Fibers to Reinforced Concrete Bridge Deck to Mitigate Cracking. was 4531.
206	Not approved for funding	Tier 4	TESMO-03	Bullock and Habib	Workzone Speed, Congestion, Queue, Crash, and Geometry analytics to support INDOT's 2020 Construction Workzone Activities (was 4538)
207	Not approved for funding	Tier 4	TESMO-08	Lee	ATSPMs -- Tools To Identify Safety Risks was 4543
208	Not approved for funding	Tier 4	TESMO-09	Boruff	Best Practices on Raised Pavement Markers (RPM) - was 4544.
209	Not approved for funding	Tier 4	TESMO	Shan	Uncover Traffic Patterns and their Social-economic Implications during the Pandemic